

**Remarks/Arguments:**

**Status of the Claims**

Claims 1-23 were pending in this application. Claim 1 has been amended to include the limitation of claim 2: "wherein the ion-conducting polymer is a liquid medium that is aqueous-based and is essentially free from organic solvents." Claim 2 has been cancelled. Claim 1 has also been amended so that step (b) requires "combining the catalysed support with a solution of the ion-conducting polymer to produce a membrane such that the catalysed support is incorporated into the solid polymer electrolyte membrane." Support for this amendment can be found throughout the specification, for example at page 8, lines 19-24. Moreover, page 8, lines 16-17, state that "the catalysed support can be incorporated into the membrane by a number of methods." Further, the phrase "wherein the amount of catalysed support incorporated into the membrane" was originally used in claims 8-10 as originally filed. The application, on page 8 and continuing through to page 9, describes methods that are used to produce a membrane from a solution of ion-conducting polymer including casting, applying and coating. Support for newly added claim 24 is found at page 8, lines 24-26.

Thus, claims 1, and 3-24 are pending in this application. Claim 1 is independent. Claim 1 is directed toward a process for preparing a solid polymer electrolyte membrane.

**Summary Of The Office Action**

In the Office Action dated July 18, 2003, claims 1-5, 13 and 16-23 stand rejected under 35 U.S.C. § 102(b) as being anticipated by EP 791,974. Claims 1-4, 11, 12, 16, and 20-23 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Cisar et al. (U.S. Pat. No. 5,635,039). Claims 1-4 and 11-23 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Denton et al. (U.S. Pat. No. 6,042,958). Claims 6-10 also stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Denton as applied to claims 1-4, 11-22 in view of EP 875,524.

**Rejection Under 35 U.S.C. Section 102(b)**

Claims 1-5, 13 and 16-23 stand rejected under 35 U.S.C. § 102(b) as being anticipated by EP 791,974. Claim 2 has been cancelled rendering the rejection moot with respect to this claim. For the reasons set forth below, the applicants respectfully submit that claims 1, 3-5, 13, and 16-23 are not anticipated by EP 791,974.

The Office Action states that EP 791,974 teaches a process for preparing a solid polymer electrolyte membrane comprising an ion-conducting polymer, catalyst, and a high surface area support material (see for example, column 9, lines 1-35). The process includes associating a 40% platinum catalyst with the support material and combining the catalyst support with an ion-conducting polymer (Nafion) in water.

The applicants respectfully disagree that EP 791,974 discloses all the features of the invention as claimed by amended claim 1. Col. 9, lines 1-35, as cited by the Examiner, disclose a process by which a first catalyst containing electrode layer is formed by conventional paper making technology. Specifically, a particulate catalyst mixture of carbon and PTFE was dispersed in water with teflonated fibers, glass microfibers and PVA. Col. 9, lines 16-19. Then, a second layer of a second particulate catalyst material was formed from an ink comprising 40 wt% platinum on carbon in a 9.5% dispersion of Nafion EW1100 in water. These two layers were then pressed to each other and together formed the cathode of the membrane electrode assembly (MEA). Thus, although the layers contain ion-conducting polymers, the combined layers alone are not a membrane. In fact, EP '974 states that the combined two electrode layers are further bonded to the membrane electrolyte face, with the membrane electrolyte being Nafion 115. Moreover, no *solution* (only dispersions) of the ion-conducting polymer was used in EP '974.

The above-described cathode of EP '974 is not a membrane as claimed in claim 1. Amended claim 1 requires "combining the catalysed support with a solution of the ion-conducting polymer to produce a membrane such that the catalysed support is incorporated into the solid polymer electrolyte membrane," as opposed to being merely bonded to the membrane as described in EP '974. The applicants contend amended claim 1 is now in a condition for allowance and respectfully request the Examiner's reconsideration.

The present invention, as claimed in amended claim 1, is directed to a membrane, not an electrode. As amended, claim 1 requires "the catalysed support is incorporated into the solid polymer electrolyte membrane." EP 791,794 does not incorporate a catalytic material into a polymer membrane. EP 791,794 presses a catalyst into a fibre structure placed next to a membrane by bonding. Because EP 791,794 lacks the required teaching of incorporating the catalyst into the membrane as required by claim 1 of the present invention, it cannot be said to anticipate the claims 1, 3-5, 13 and 16-23. The Examiner's reconsideration is earnestly requested.

Because the applicants believe amended claim 1 is now in a condition for allowance and claims 2-5, 13 and 16-23 depend either directly or indirectly from claim 1, the applicants also believe these claims are now in a condition for allowance.

Claims 1-4, 11, 12, 16 and 20-23 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Cisar *et al.* (U.S. Pat. No. 5,635,039). The Office Action states that Cisar teaches a process for preparing a solid polymer electrolyte membrane comprising an ion-conducting polymer, a catalyst, and a high-surface area support material (see claims 9-33.) A platinum catalyst is added to a support material that may be titanium oxide and combining the catalyzed support with the ion-conducting polymer (Nafion) in water (see example 1). The support material is then bonded to an ion exchange membrane. For the reasons set forth below, the applicants respectfully submit that claims 1-4, 11, 12, 16 and 20-23 are not anticipated by Cisar.

Cisar is generally directed to a membrane comprising a thin sheet of a ion-conducting, electron insulating material having an internal passage extending therethrough for delivery of fluids. As cited by the Examiner in example 1, a porous titanium substrate is plated with platinum. Plating a titanium substrate is not "associating the catalyst with the support material to form a catalysed support" as required by step (a) of claim 1. The titanium substrate is not a "high surface area support material" as required by claim 1, but a porous electrode substrate. The platinum of Cisar is not used as a catalyst. It is used to eliminate passivation problems (see col. 9, lines 37-48).

In addition, there is no disclosure in Cisar that the catalyzed support material is incorporated into the solid polymer electrolyte membrane as required by amended claim 1. Cisar requires that the electrolyte catalyst layers are impregnated with a 5% Nafion solution, as

commonly practiced in the art. The layers are subsequently bonded to a membrane (see col. 5 line 61 through col. 6 line 3). The bonding of a membrane in Cisar is not the same as incorporating the catalyst into the membrane as required in the claimed invention. Because Cisar does not teach associating the catalyst with the support material, nor teach the incorporation of the catalyzed support into the solid polymer electrolyte membrane, Cisar cannot be said to anticipate the present invention.

Accordingly, the applicants believe amended claim 1 is now in a condition for allowance and respectfully request the Examiner's reconsideration of this rejection. Because claims 2-4, 11, 12, 16 and 20-23 depend either directly or indirectly from now allowable claim 1, the applicants respectfully submit these dependant claims are also in condition for allowance.

**Rejection Under 35 U.S.C. Section 102(e)**

Claims 1-4 and 11-23 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Denton *et al.* (U.S. Pat. 6,042,958). The Office Action states that Denton teaches a process for preparing a solid polymer electrolyte membrane comprising an ion-conducting polymer, a catalyst and high-surface area support material (See claims 1-28). The membrane is a mixture of a porous substrate of fibers and at least one ion-conducting polymer. Glass, silica, ceramic, quartz, and other materials are noted as fibers. A catalyst, such as platinum, may be added to a support material oxide (see claim 12 and col. 5, lines 15-40). The fibers are combined with the ion-conducting polymer (Nafion) in an aqueous solution, (see the examples). The fibers have a diameter of 0.1-50  $\mu\text{m}$ . A solution of perfluorsulfonic acid is added to the fibrous material (see the examples).

The applicants respectfully disagree that Denton discloses all the features of the invention as claimed by amended claim 1. Col. 6, lines 23-39 of Denton disclose a process in which particulate matter may first be coated with a catalyst and then added to a fiber containing slurry and/or to polymeric material, prior to formation of a membrane. The examples in Denton disclose processes that use aqueous solutions of polymeric materials. There is no disclosure in Denton, however, of a process as claimed by amended claim 1 of the present invention. In particular, Denton does not disclose a process where a catalyst is associated with the support material, which is incorporated into a membrane and the membrane is formed from an aqueous ion-conducting polymer solution. Further, the membrane of the present invention is formed in an aqueous ion-conducting polymer solution. If

the catalysed support material would come into contact with an organic ion-conducting polymer solution, there would be considerable risk of fire. This element is recited in step (b) of claim 1 "wherein the ion-conducting polymer is in a liquid medium that is aqueous-based and is essentially free from organic solvents." Denton, therefore, does not disclose each and every limitation of the claimed invention.

The applicants believe amended claim 1 is now in condition for allowance. Because claims 2-4 and 11-23 depend either directly or indirectly from claim 1, the applicants also believe these dependant claims are in condition for allowance. Accordingly, the applicants respectfully requests the Examiner's reconsideration of this rejection.

**Rejection under 35 U.S.C. Section 103(a)**

Claims 6-10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Denton as applied to claims 1-4 and 11-22 in view of EP 875,524. The Examiner recognizes that Denton fails to teach the amount of catalyst deposited on the support material as claimed in claims 6 and 7. The Examiner also recognizes that Denton fails to teach the specific metal loading as recited in claims 8-10. In forming the obviousness rejection, the Examiner suggests that EP 875,524 teaches a carbon supported Pt catalyst with a loading of  $0.25 \text{ mg/cm}^2$ , which will amount to less than 25% of the electrode weight. The Examiner then concludes that one of ordinary skill would have the understanding of the amounts of catalyst necessary to react with the fuel and oxidant gasses based upon the teachings of EP 875,524. The applicants respectfully disagree.

Currently amended claim 1 recites the steps of "associating the catalyst... and combining the support with a solution of the ion-conducting polymer to produce a membrane ... such that the catalysed support is incorporated into the solid polymer electrolyte membrane." The applicants contend that currently amended claim 1 is not obvious in view of the above references. Because claims 6-10 depend either directly or indirectly from claim 1, the applicants contend that claims 6-10 are also now in a condition for allowance and request early notification to that effect.

Regarding newly added claim 24, support for claim 24 is found at page 8, lines 24-26. Because claim 24 depends from amended claim 1, the applicants contend that claim 24 is also in a condition for allowance for the reasons expressed above. Furthermore, as mentioned

above, none of the cited references teach the claim 1 limitations of "associating the catalyst ... and combining the support with a solution of the ion-conducting polymer to produce a membrane ... such that the catalysed support is incorporated into the solid polymer electrolyte membrane" let alone the limitations of claim 24, which recite "directly casting the membrane from the mixture of the catalysed support and the solution of the ion-conducting polymer."

In view of the foregoing amendments and remarks, the applicants submit that this application is in condition for allowance and respectfully request early and favorable notification to that effect. If it would expedite prosecution of this application, the Examiner is invited to confer with the applicants' undersigned attorneys.

Respectfully submitted,



Christopher R. Lewis, Reg. No. 36,201  
Christian M. Bauer, Reg. No. 51,443  
Attorneys for Applicants

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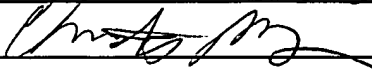
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☒ P.O. Box 980  
Valley Forge, PA 19482  
(610) 407-0700

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